



FOCUS ON HYDROGEN

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International Energy Agency, Paris

**IEA Hydrogen Implementing Agreement
25th Anniversary - Sept. 7, 2004 – Washington**



International Energy Agency

Since 1974, an autonomous body within the OECD, working for the stability of the energy market and international co-operation

The IEA is ...

- Energy Policy
- Energy Market
- Energy Outlook
- Energy Technology
- Energy Emissions
- Energy Economics
- Energy Statistics
- Energy Co-operation





Energy Outlook: Trends

- Energy demand will grow 66% by 2030
- Fossil fuels will still dominate
- Transport will drive oil demand
- Global emissions continue to grow
- Still 1.6 bn people with no electricity
- OECD energy imports will increase

This is not sustainable ...



The IEA 3Es Goals

- **Energy Security**
Satisfy growing demand, diversify supply
- **Environment Protection**
Address environmental concerns
- **Economic Development**
Fuel economic growth for all

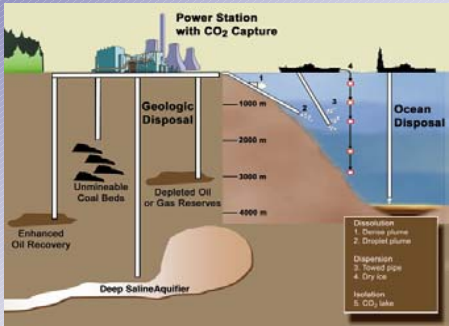
Advanced technologies and international co-operation are part of the solution



Not only Hydrogen ...



Energy Efficiency



Fossil Fuels with CO₂ Sequestration



Nuclear Power Generation IV

No Single Technology or Policy can do it all

Different ...

- Regions - Resources
- Markets - Choices
- Scale-up - Timing
- Infrastructure



Hydrogen and Fuel Cells



Renewable Energy



Bio-mass and Bio-fuels



Why Hydrogen & Fuel Cells...

- A clean, flexible energy carrier from many sources: fossil, renewable, nuclear
- A flexible technology for many uses: electricity, transport, residential, industry
- Together, a possible, CO₂-free solution for fueling transport
- A promising option to develop ...



The Way Forward

- **Reduce cost of hydrogen and fuel cells**
- **Improve hydrogen storage in FC vehicles**
- **Capture and store CO₂ to extract hydrogen from fossil fuels (coal, gas)**
- **Build infrastructure, set standards**
- **Public information, co-ordination with industry, and ...**
- **Realism and R&D**



A Few Figures ...

Fuel Cells

- Today's cost: \$ 3,000- 5,000/kW (ICEs' cost < \$50/kW)
- Today's large-scale production cost : \$300- 350/kW (?)
- Lifetime: 30- 50% less than ICEs; Efficiency: 2 x ICEs
- R&D target: same cost as ICEs

Hydrogen

- Today's world production: some 40 Mt/y
- Today's price: \$ 20-100/GJ (oil price: \$ 7/GJ ~ \$ 40/b)
- R&D target: \$ 8-12/GJ production cost from nat. gas
- Projected cost of CO₂-free hydrogen from ...
 - coal/gas : 12-18
 - biomass: 15-25
 - wind energy: 22-35
 - nuclear energy: 20-25



Conclusions, So Far ...

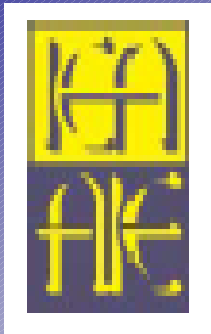
- A high-potential option - maybe the key for zero-emissions in transport
- Cost remains the challenge
- CO₂-free hydrogen from fossil fuels or biomass are the most competitive
- Transition could take decades
- More analysis needed on strategies, investment, market
- Numerous competing technologies for future energy supply !



IEA Hydrogen Implementing Agreement

- A key, successful story in the IEA International Co-operation Framework
- 25-years of R&D achievements and expertise in H₂ production, storage, systems analysis, ...
- Independent source of information for policy makers and the public
- Active, growing country membership
- Dynamic leadership

The IEA is proud to host HIA among some 40 international co-operation projects!





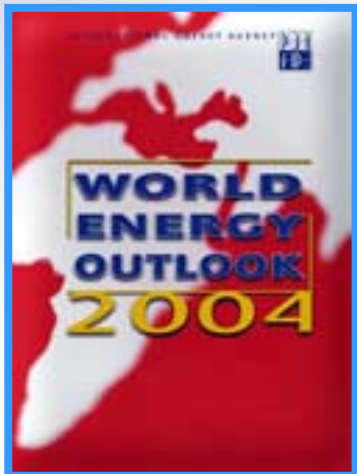
More information on IEA

www.iea.org

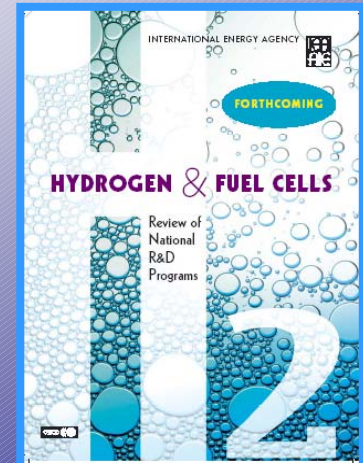
- IEA - *World Energy Investment Outlook 2003*
- IEA - *Findings of Recent IEA Work 2003*

to be published soon:

- IEA - *World Energy Outlook 2004*
- IEA - *Hydrogen & Fuel Cells: Review of National R&D Programs*



THANK YOU
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Recent IEA Publications

